ELEC 244: Introduction to Physical Electronics
Spring 2022 Syllabus

Instructor
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Hours
Lecture: Friday 11:00-11:59 am [Duncan Hall 1070]
Labs: Thursday 2:30 - 4:59 pm / Friday 2:30 - 4:59 pm [FEP 102]
Office Hours: By appointment

Course Page
Everything will be posted to Canvas.

Text
Horowitz & Hill, *The Art of Electronics*, 3rd Edition. (Amazon)
This is an expensive textbook and is not required for the course, but it is an amazing resource. We can only skim the surface but it will serve you well in future years.

Materials
Assuming a reasonably soon return to in-person instruction, no materials need to be purchased.

Prerequisites
ELEC 244 assumes knowledge of circuits at the level of ELEC 241. You should be comfortable designing, measuring, and debugging circuits on a breadboard using scopes and DMMs. You should be comfortable with frequency-domain concepts and phasor notation.

Grading

Homework	25%
Lab attendance	10%
Lab results (as checked by labbies)	25%
Lab reports	32%
Final project	8%

Most weeks there will be a homework assignment that will cover the topics to be explored in the following lab. So doing the HW will make it easier to do the lab.

Most lab groups will be 2 students. The default assumption is that lab report grades will be shared equally by all group members. However, if the instructors or labbies determine that students are failing to contribute to the lab work or to the reports then significant grade reductions can occur.

There will be a laboratory assignment most weeks. Lab reports from the assignments will be due the following Friday online at the beginning of class unless otherwise noted.

The basic grading structure will be the usual thresholds -- 90% for some flavor of A, 80% for some flavor of B, 70% for C, etc. Depending on how the course work goes, the instructor may lower the thresholds for the grades (but I promise not to raise them).

Attendance

Attendance of the lectures and lab sessions are required.

You and your lab partner should attend your lab session at the scheduled time. If you need to miss a significant fraction of either lab time, however, you should clear it with the instructor in advance. Failure to attend a lab session, or significant lateness more than once, will negatively impact your grade. There will be undergraduate lab assistants in each lab session, and I will also attend. Labbies will also grade the lab reports.

Honor System

The homework assignments will be individually graded. Collaboration on homework assignments is encouraged, but the work you submit should be your own. Do not just copy others' homework, and don't submit any work you don't understand. You will have one or more lab partners for your lab assignments. Partners should contribute equally to the work. It's OK to divide the work among group members but each student should be able to answer any questions about the lab or the writeup. Groups should not copy each other's work except in cases specifically allowed by the instructor. Using unauthorized aid or misrepresenting one's work is a Rice Honor Code violation.

Online Course Material

For course material that I generate or generated by the prior instructor (Dr. Gary Woods), students may use the material for any course-related purpose. However, I ask students not to remove the copyright notices if they forward or otherwise re-use the material. (The copyright notices are included to preserve my rights or Dr. Woods' rights in the event that material is included in some future publication.)

Special Requirements

If you have a documented disability that may affect academic performance, you should: 1) make sure this documentation is on file with Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) meet with the instructor(s) to discuss your accommodation needs.

Supplemental Reading

These are books that give more detail on various topics and may be of interest to students specializing in devices or applied physics, or who simply want a different perspective on the course material.

Dostal, *Operational Amplifiers*, 2nd ed. (Butterworth-Heineman, 1993) -- if you really want to see opamps covered on a strong theoretical foundation, read this book. It covers all ideal and many non-ideal aspects of opamps. This book shows you where all the rules of thumb really come from.

Hobbs, *Building Electro-Optical Systems: Making it All Work*, 2nd ed. (Wiley, 2009). A truly excellent source of lore on optics and associated electronic systems. Written at a graduate level, the book is encyclopedic. Chapter 18 on analog front-end systems is sublime. No student of optics should be without this book.

Learning Objectives

By the end of the course, students should be able to:

- Use oscilloscopes, function generators etc. to perform measurements on real circuits
- Calculate and make Bode plots of transfer functions involving op amps and RLC elements
- Use frequency response to analyze stability of feedback systems
- Design circuits that include passives, op amps, and instrumentation amps
- Construct and test circuits incorporating passives, opamps, other ICs, and discrete transistors, on breadboards
- Use SPICE to simulate circuits
- Calculate and make Bode plots of transfer functions of passive and active filters
- Utilize timer ICs such as the 555 in circuits
- Design circuits that incorporate instrumentation amplifiers
- Design, construct, and characterize an analog spectrum analyzer

Syllabus Modifications

Information contained in this syllabus, other than the absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor(s).